SRO written exam items

"Special attention is required to ensure that the SRO examination tests at the appropriate level."

Bruno Caballero, RII

Presentation Objectives

1. Summarize the requirements for SRO written exam items
2. Describe how to write a SRO-only question
3. Assess proposed questions to see if the SRO-only requirements are being met
4. Q&A's / Feedback

Objective # 1

Summarize the requirements for SRO written exam items

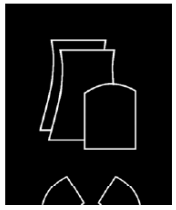
Operator Licensing
Examination Standards
For Power Reactors

NUREG-1021, ES-401 Requirement

- The SRO outline shall include 25 K/A statements that relate to the topics in 10 CFR 55.43(b).

[ES-401, Section D.1.c, page 5 of 33]

Tier	Group	SRO-Only Points		
		A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1			6
	2			4
	Tier Totals			10
2. Plant Systems	1			5
	2			3
	Tier Totals			8
3. Generic Knowledge and Categories		1 2 3 4		7



NUREG-1021
Rev. 9, Supp. 1

Operator Licensing
Examination Standards
For Power Reactors

NUREG-1021, ES-401 Requirement

An SRO question shall also evaluate the additional knowledge and abilities in accordance with 10CFR55.43(b) or the facility licensee's learning objectives.

[ES-401, Section D.2.d, page 7 of 33]

Plant Specific Exemptions

(www.nrc.gov/reactors/operator-licensing/op-licensing-files/sro-only-ml1007100031.pdf)

- IF a licensee desires to evaluate a knowledge/ability that is not tied to one of the 55.43(b) items, THEN there must be some documentation that the knowledge/ability is "unique-to-the-SRO position" at the site.
  - For example, labeled as "SRO-only" in the lesson plan or SRO task list (not included in the RO task list).

Summary of SRO item Requirements

- The K/A must be either “A2”, “G”, or related to fuel handling.
- Each SRO question must also evaluate a 10CFR55.43(b) knowledge/ability item.
- IF a licensee desires to evaluate a knowledge/ability that is not tied to one of the 55.43(b) items, THEN there must be documentation that the knowledge/ability is “unique-to-the-SRO position” at the site

Objective # 2

Describe how to write an SRO question

How to write an SRO question

- Read the K/A
- Choose 1 of the 7 items in 10CFR55.43(b) that lends itself to the K/A wording.

  Most often…….. (but not limited to)

  - Item # 2 (Tech Specs & Bases)
  - Item # 5 (Procedure *Selection*)
- Write the question to target the K/A and to test the additional SRO knowledge/ability for the selected 10CFR55.43(b) item

What 55.43 item(s) can be tested *within* the wording of the K/A?

(1) Conditions and limitations in the facility license.

(2) Facility operating limitations in the technical specifications and their bases.

(3) Facility licensee procedures required to obtain authority for design and operating changes in the facility.

(4) Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.

(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

(6) Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity.

(7) Fuel handling facilities and procedures.

APE: **057 Loss of Vital AC Electrical Instrument Bus**

AA2. **Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus:**
(CFR: 43.5 / 45.13)

PWR example

AA2.05 S/G pressure and level meters.....

APE: 295003 Partial or Complete Loss of A.C. Power

AA2. **Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER :**
(CFR: 41.10 / 43.5 / 45.13)

BWR example

AA2.02 Reactor power / pressure / and level.....

Tech Specs?

Selecting a procedure?

E-plan?

075 Circulating Water System

2.1.25 **Ability to interpret reference materials, such as graphs, curves, tables, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.9 SRO 4.2

PWR example

400000 Component Cooling Water System

2.1.25 **Ability to interpret reference materials, such as graphs, curves, tables, etc.**
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.9 SRO 4.2

BWR example

Does any 10CFR55.43(b) topic lend itself to the wording of the K/A?

Important facts….

- The fact that a licensee trains its ROs to master certain 10CFR55.43 items does NOT preclude the item from being used as an SRO test item. [OL Feedback Web page Item 401.36]
- The fact that a K/A is linked to both 10CFR55.41 and 10CFR55.43 does NOT mean that the K/A cannot be used to develop an SRO test item, nor does it exclude the K/A from sampling on the RO exam.
  [ES-401, Section D.1.c, page 5 of 33]

Objective # 2

Assess proposed SRO questions to see if the requirements are met

Refer to your handout packet

001 Control Rod Drive System (CRDS)
A2.19 Ability to (a) predict the impacts of the following malfunction or operations on the CRDS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Axial Flux Distribution
[CFR 41.5 / 43.5/ 45.3/ 45.13] SRO 4.0

During a power increase on Unit 1, the following timeline of events occurred:

18:00 Power stabilized at 85% for calorimetric. Δ flux target was 0.0%; Δ flux readings were in the target band for the past 48 hours.
18:01 Rod control circuit malfunction causes rods to insert
18:02 Rod motion is stopped

	Δ Flux	NI-41	NI-42	NI-43	NI-44
18:03	-13.0%	85%	84%	85%	86%
18:17	-13.0%	85%	84%	85%	86%
18:37	-10.0%	85%	84%	85%	86%
19:05	-6.0%	85%	84%	85%	86%
19:10	-5.0%	85%	84%	85%	86%

Which ONE of the following completes the statement in accordance with Tech Spec 3.12, Control Rod Assemblies and Power Distribution Limits, and Tech Spec Bases?

At 19:11, reactor power _____ allowed to be raised above 90%, and the reason for this is because _____.

[REFERENCE PROVIDED]

A. is NOT;
radial xenon distribution has been affected to the extent that a reactor power reduction and subsequent power range high flux trip setpoint reduction are required.

B. is NOT;
axial xenon distribution has been affected to the extent that a reactor power reduction and subsequent power range high flux trip setpoint reduction are required.

C. is;
radial xenon distribution in the core was NOT affected such that the heat flux peaking factors changed and can be returned within the target band at 100% power.

D. is;
axial xenon distribution control at less than 90% power is not as significant as at 100% power; allowances in the accident analyses (bases for Δ flux procedures) account for heat flux peaking factors during accidents at less than 90% power.

295026 Suppression Pool High Water Temperature

A2.03 Ability to determine and/or interpret the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Reactor Pressure

[CFR: 41.10 / 43.5 / 45.13] SRO 4.0

88. An event on Unit One has resulted in the following plant conditions:

Reactor pressure	1000 psig
Reactor Water Level	120 inches
Control Rod Positions	All unknown
APRMs	Downscale
Drywell pressure	3 psig
Supp. Pool pressure	2 psig
Supp. Pool water temp	150° F
Supp. Pool water level	-4 feet

(Reference provided)

Which one of the following identifies the status of the Heat Capacity Temperature Limit (HCTL) and the required procedure for reactor pressure control?

	HCTL	Pressure Control Leg of Procedure
A.	has been exceeded	RVCP
B.	has been exceeded	LPC
C.	has NOT been exceeded	RVCP
D.	has NOT been exceeded	LPC

003 Dropped Control Rod

AA2.01

Ability to determine and interpret the Rod position indication to actual rod position as they apply to the Dropped Control Rod

[CFR: 43.5/ 45.13] RO 3.7/ SRO 3.9

Unit 3 is at End of Core Life and Control Bank D Rod M-8 dropped into the core.

One hour after retrieval of Rod M-8, the SRO directs the RO to *"Verify all RCC Assemblies are Aligned to Within the Allowed Rod Misalignment of Step Counters."*

- The "D" Bank step counters currently read D-180 steps.
- RPI indications are:

Control Rod RPI	Indication
M-8	167
H-8	166
O-8	195
H-4	160
H-12	199

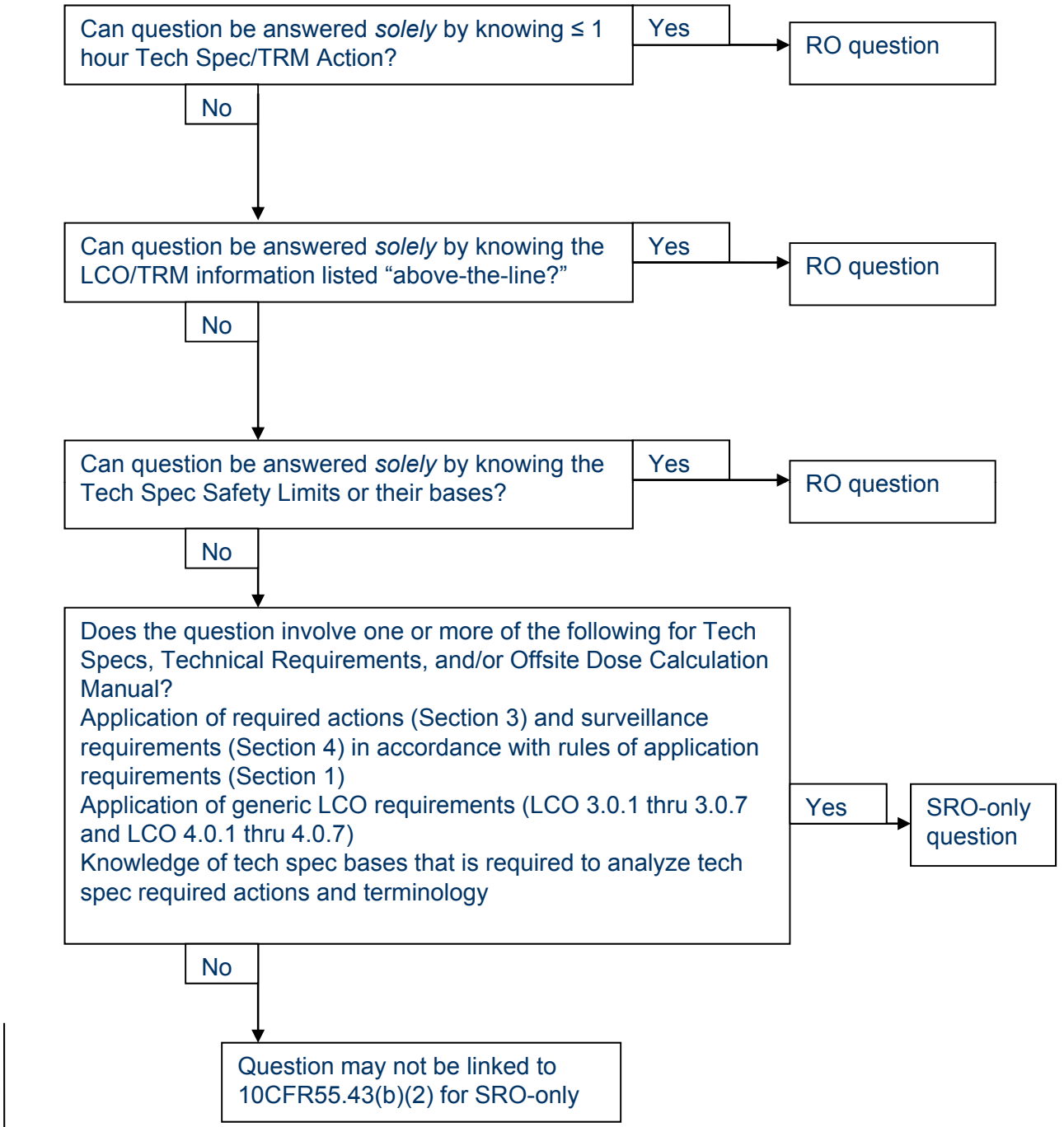
As defined by Tech Specs, which ONE of the following describes the condition of Control Bank "D" rod indications and the required SRO response (if any)?

A. *Only* Control Rod H-4 exceeds the Allowed Rod Misalignment
Direct RO to restore H-4 alignment w/i 1 hr or reduce power <75% w/i 1 hr

B. *Only* Control Rods H-4 & H-12 exceed the Allowed Rod Misalignment
Direct RO to restore H-4 & H-12 alignment w/i 1 hr or Hot Standby w/i 6 hrs.

C. All control rods in Bank "D" exceed the Allowed Rod Misalignment
Direct RO to restore all Bank "D" rods alignment w/i 1 hr or Hot Standby w/i 6 hrs

D. All control rods in Bank "D" are within the Allowed Rod Misalignment
No SRO response is required


Can question be answered *solely* by knowing ≤ 1 hour Tech Spec/TRM Action?
Yes
RO question
No
Can question be answered *solely* by knowing the LCO/TRM information listed "above-the-line?"
Yes
RO question
No
Can question be answered *solely* by knowing the Tech Spec Safety Limits or their bases?
Yes
RO question
No
Does the question involve one or more of the following for Tech Specs, Technical Requirements, and/or Offsite Dose Calculation Manual?
Application of required actions (Section 3) and surveillance requirements (Section 4) in accordance with rules of application requirements (Section 1)
Application of generic LCO requirements (LCO 3.0.1 thru 3.0.7 and LCO 4.0.1 thru 4.0.7)
Knowledge of tech spec bases that is required to analyze tech spec required actions and terminology
Yes
SRO-only question
No
Question may not be linked to 10CFR55.43(b)(2) for SRO-only

K/A 295021 Loss of Shutdown Cooling

AA2. Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING :

AA2.03 Reactor water level

- CFR: 41.10 / 43.5 / 45.13
- RO 3.5 / SRO 3.5

Unit 1 is in Hot Shutdown with "1B" Residual Heat Removal (RHR) aligned for Shutdown Cooling at 7700 gpm with the following conditions:

- o Reactor Coolant temperature / level ..... 220°F / +37”
- o Both Reactor Recirculation Pumps are secured

An electrical fault causes 1E11-F009, "SDC Suction VLV" to CLOSE and it cannot be re-opened. Which ONE of the following choices completes the following statements?

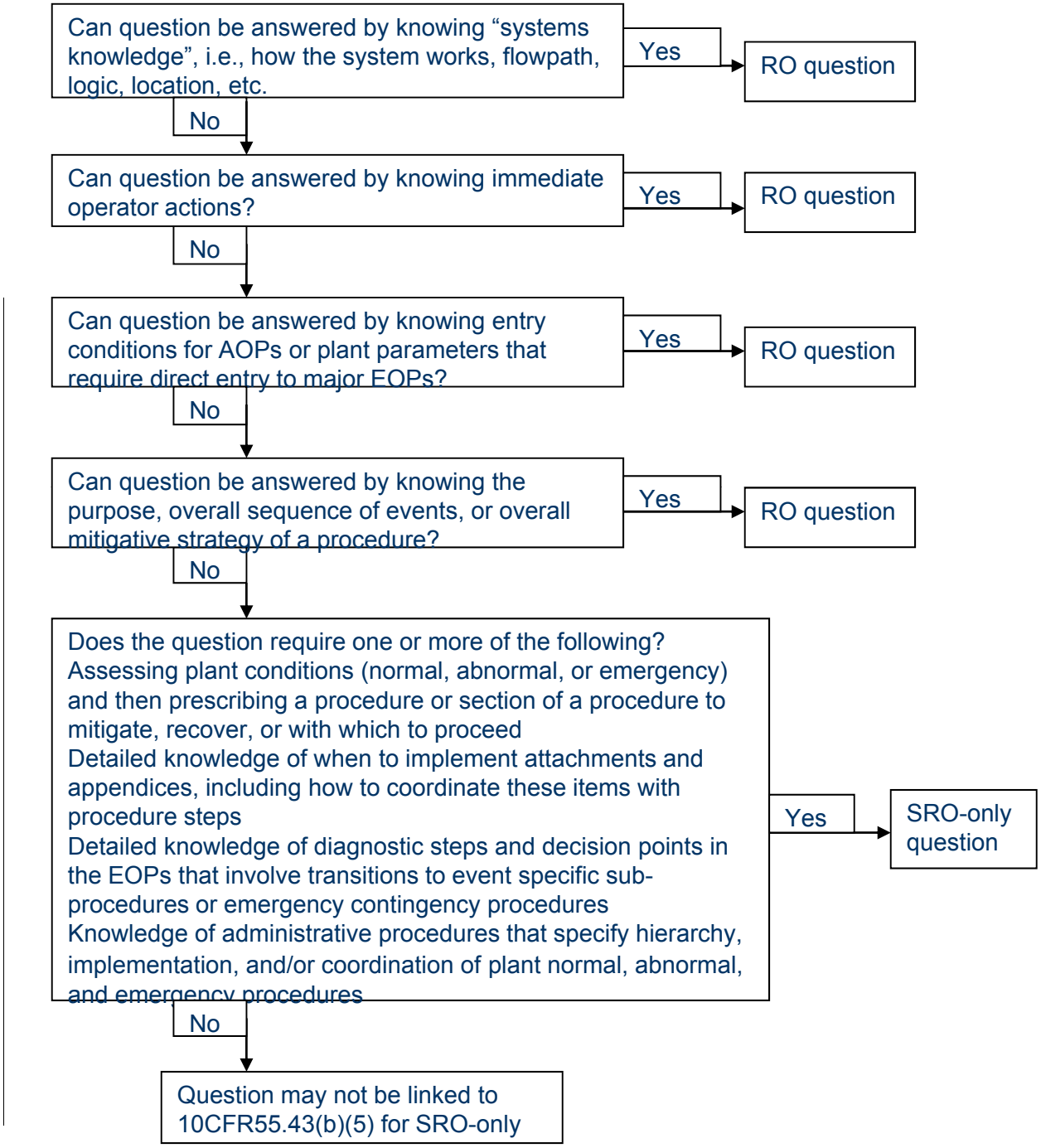
Reactor water level __(1)__ adequate to ensure there is a flow path available for reactor coolant natural circulation. The Shift Supervisor will direct performance of _____(2)_____.

A. is NOT / 34SO-B31-001-1, "Reactor Recirculation System“, Section 7.1.2, "Recirc pump A(B) Startup“

B. is / 50AC-MNT-001-0, "Maintenance Program" section 8.1.7, "Emergency Maintenance“

C. is NOT / 34SO-E11-010-1, "RHR System" section 7.4.2, "Shifting Shutdown Cooling Loops“

D. is / 34GO-OPS-013-1, "Plant Shutdown" Attachment 1, Cooldown / Depressurization Check", every 15 minutes


Can question be answered by knowing "systems knowledge", i.e., how the system works, flowpath, logic, location, etc.
Yes
RO question
No
Can question be answered by knowing immediate operator actions?
Yes
RO question
No
Can question be answered by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs?
Yes
RO question
No
Can question be answered by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
Yes
RO question
No
Does the question require one or more of the following?
Assessing plant conditions (normal, abnormal, or emergency) and then prescribing a procedure or section of a procedure to mitigate, recover, or with which to proceed
Detailed knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
Detailed knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures
Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
Yes
SRO-only question
No
Question may not be linked to 10CFR55.43(b)(5) for SRO-only

Presentation Objectives

1. Summarize the requirements for SRO written exam items
2. Describe how to write a SRO-only question
3. Assess proposed questions to see if the SRO-only requirements are being met
4. Q&A's / Feedback

Objective # 3

Q & As and Feedback

401.11 - Tech[nical] spec[ifications] (TS) are too complicated to memorize. They should be open reference or better yet covered by the operating exams (JPM). We do not want our operators to spend valuable time memorizing TS, nor do we want them to operate from memory.

The NRC does not expect operators to memorize the TS, nor does it endorse operating the plant from memory. However, the NRC does expect operators to recognize TS entry conditions, immediate actions, and (in the case of senior operators) bases when presented in a multiple choice format on the written examination. If they do not compromise the integrity of other questions on the exam, it is acceptable to provide extracts from the TS to the license applicants for use in answering application-level questions.

401.30 - Regarding ES-401, Section D.2.d: Cannot write SRO only questions for all seven items listed under 55.43(b). Only three items lend themselves to SRO only type questions. Need multiple examples and training for writing SRO only questions for all seven items.

Comment noted. The operator licensing program office is looking into the quality and consistency of SRO-only questions and may develop additional guidance in this area. This is also a good topic for discussion during NRC and industry item-writing workshops, which the NRC will support to the extent possible. ***SRO-only Clarification Guidance Document has examples for all 7 items in 55.43 (b).***

What's the difference between RO and SRO procedure knowledge? For example, both 10 CFR 55.41(b)(10) and 55.43(b)(5) require emergency operating procedure (EOP) knowledge.

The "SRO-level" questions must evaluate the additional knowledge and abilities necessary for "assessment of facility conditions and selection of appropriate procedures during ... emergency situations." Questions that evaluate the knowledge of specific bases for EOPs (K/A 2.4.18) and/or the operational implications of EOP cautions (K/A 2.4.20), but not the higher level "assessment and selection" knowledge, would generally not be valid "SRO-level" questions.

One area of SRO level knowledge (with respect to prescribing or selecting any procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.